

Extension of an Object Oriented Multidisciplinary Analysis Optimization (MDAO) Environment, Phase I

Completed Technology Project (2010 - 2011)



Project Introduction

Multidisciplinary design, analysis, and optimization (MDAO) tools today possess limited disciplines with little fidelity modeling capability. These tools are typically developed as a single large software application that performs analysis for all disciplines but has little or no capability to integrate multi-fidelity and multi-discipline components that have already been developed as stand-alone analysis codes. Even though a multitude of tools have been developed and well adapted to the interdisciplinary aircraft design/analysis, they have not been developed to work together. The objective of the development of the MDAO tool is to generate a "central executive" that can integrate disparate software packages in a cross platform network environment so as to perform optimization and design tasks in a cohesive streamlined manner. This object-oriented framework can integrate the analysis codes for multiple disciplines, instead of relying on one code to perform the analysis for all disciplines. ZONA Technology and its team member Virginia Polytechnic Institute propose to develop three object-oriented components that will fully leverage tools currently under development within NASA's MDAO framework. The three major components are: (1) an automatic re-meshing tool that can provide a fast and efficient mesh generation capability for complex structures like curved panels with curved stiffeners and aircraft wings of any shape with curved spars and ribs. (2) a hybrid optimization tool that combines a non-gradient based optimization method and a gradient based optimization method. The advantage of this hybrid optimization is that a global optimum point can be achieved through the non-gradient optimization and acceleration of the convergence can be obtained by aiding gradient based optimization algorithm. (3) a fast transonic unsteady aerodynamics method for accurate aeroelastic analysis and shape sensitivity information due to the change of external wing shape.



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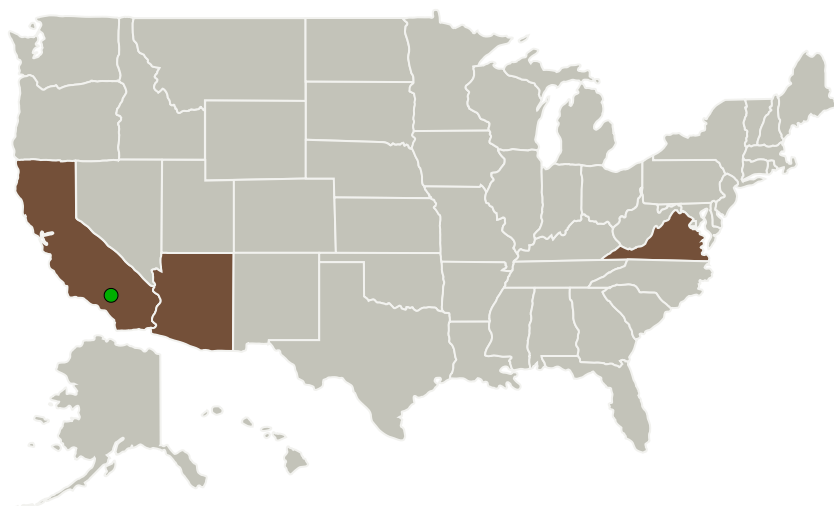
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
ZONA Technology, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Scottsdale, Arizona
● Armstrong Flight Research Center (AFRC)	Supporting Organization	NASA Center	Edwards, California
Virginia Polytechnic Institute and State University (VA Tech)	Supporting Organization	Academia	Blacksburg, Virginia

Primary U.S. Work Locations

Arizona	California
Virginia	

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

ZONA Technology, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

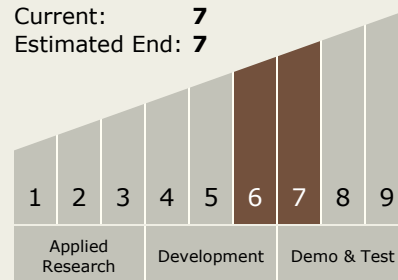
Carlos Torrez

Principal Investigator:

Dong-hwan Lee

Technology Maturity (TRL)

Start: 6
Current: 7
Estimated End: 7



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Project Transitions



January 2010: Project Start



January 2011: Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138994>)

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
 - └ TX15.1 Aerosciences
 - └ TX15.1.3 Aeroelasticity

Target Destinations

The Sun, Earth, The Moon,
Mars, Others Inside the Solar
System, Outside the Solar
System